

REVIEW ARTICLE

Psychological autopsy studies of suicide: a systematic review

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ABSTRACT

Background. The psychological autopsy method offers the most direct technique currently available for examining the relationship between particular antecedents and suicide. This systematic review aimed to examine the results of studies of suicide that used a psychological autopsy method.

Method. A computer aided search of MEDLINE, BIDS ISI and PSYCHLIT, supplemented by reports known to the reviewers and reports identified from the reference lists of other retrieved reports. Two investigators systematically and independently examined all reports. Median proportions were determined and population attributable fractions were calculated, where possible, in cases of suicide and controls.

Results. One hundred and fifty-four reports were identified, of which 76 met the criteria for inclusion; 54 were case series and 22 were case–control studies. The median proportion of cases with mental disorder was 91% (95% CI 81–98%) in the case series. In the case–control studies the figure was 90% (88–95%) in the cases and 27% (14–48%) in the controls. Co-morbid mental disorder and substance abuse also preceded suicide in more cases (38%, 19–57%) than controls (6%, 0–13%). The population attributable fraction for mental disorder ranged from 47–74% in the seven studies in which it could be calculated. The effects of particular disorders and sociological variables have been insufficiently studied to draw clear conclusions.

Conclusions. The results indicated that mental disorder was the most strongly associated variable of those that have been studied. Further studies should focus on specific disorders and psychosocial factors. Suicide prevention strategies may be most effective if focused on the treatment of mental disorders.

INTRODUCTION

Suicide causes concern among doctors, other health professionals, policy makers and the general public. The fundamental question of what drives a person to take their own life remains unanswered despite numerous studies. The major obstacle to an understanding of suicide is that the victim cannot be interviewed and the reason directly ascertained. One solution has been the development of the psychological autopsy. This

technique is based upon a combination of interviews of those closest to the deceased and an examination of corroborating evidence from sources such as hospital and general practice case-notes, social work reports and criminal records. From this information an assessment is made of the suicide victim's mental and physical health, personality, experience of social adversity and social integration. The aim is to produce as full and accurate a picture of the deceased as possible with a view to understanding why they killed themselves. Psychological autopsy is probably the most direct technique currently available for determining the relationship between particular risk factors and suicide. This

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type of intensive approach not only provides direct information but also aids the interpretation of studies employing other techniques (Hawton *et al.* 1998).

There are now in excess of 150 reports on psychological autopsy studies of suicide in the world literature. In this paper we report a systematic review of these studies. We aimed to answer two questions. First, which variables, of those studied, have the strongest association with suicide. Secondly, what is the potential impact of effectively treating such problems on suicide rates.

METHOD

All reports of psychological autopsies conducted to investigate death by suicide that included direct interviews with informants were eligible for inclusion (Beskow *et al.* 1991). We first searched three computerized databases up to June 2000; MEDLINE (from 1/1966), BIDS ISI (from 1/1981) and PSYCHLIT (from 1/1990). Our search used the key words [PSYCHOLOGICAL AUTOPSY] or [SUICIDE] or [PSYCHOLOGICAL AUTOPSY and SUICIDE]. All on-line abstracts were reviewed and reprints of all potentially eligible reports were obtained. We supplemented this search strategy by obtaining all reports cited in the reference lists of these papers.

Data extraction

All the reports were reviewed independently by two investigators (J.C. and A.C.). A structured proforma was used to assess eligibility and to extract relevant data. The proforma recorded the sampling technique, geographical area sampled and representativeness of the sample, the method of psychological autopsy, psychiatric diagnostic criteria used and methods of analysis. The findings of the studies were recorded in the following categories, which were chosen as they have been linked to suicide epidemiologically and are commonly used for clinical risk assessment.

Medical

Medical details were recorded for the following five categories.

Presence of mental disorder

Both individual diagnoses according to the Diagnostic and Statistical Manual (DSM) III, III-R

or IV (American Psychiatric Association, 1994) categories and the presence of two or more DSM diagnoses, including mental disorder and substance abuse disorder was noted.

History of deliberate self-harm

History of deliberate self-harm was recorded as actual attempts rather than threats.

Service contact

This was defined as lifetime contact with mental health professionals.

Communication of intent

Communication of intent by deceased to health professional over lifetime was recorded.

Presence of physical ill-health

Social

Adverse life events

This was defined as interpersonal difficulties and/or loss (Rich *et al.* 1988; Heikkinen *et al.* 1992), and was divided into three time periods for case series: within the final 3 months; from 6 to 12 months; and in the last year before death.

Social isolation

Social isolation was defined as living alone, having little or no contact with support networks of family and friends and being unmarried.

The results of data extraction by each rater were compared and any discrepancies resolved by a third investigator (S.L.). When more than one report of data from the same patient sample was identified, the report with the largest number of participants recording the variable of interest was used.

We chose not to calculate a numerical quality score for each report, as has been recommended for randomized trials, but to explore the effects of various possible biases as recommended for systematic reviews of observational studies (Egger *et al.* 1998).

Statistical analysis

The median rates and 95% confidence intervals were calculated (Gardner & Altman, 1998) for each of the studied variables and the range of scores described. To quantify the impact of any one factor or group of factors, population attributable fractions (PAFs) were calculated (Last, 1988). PAFs estimate the proportion of

cases (e.g. suicides) in a population that can be attributed to the exposure (e.g. mental disorder) and can be interpreted as the fraction of cases in a population that could be avoided by reducing or eliminating the exposure. This assumes a direction of causality, which can be justified in suicide; for obvious reasons suicide cannot cause any of the studied variables. PAFs can only be calculated from controlled studies. When cases and controls are matched for one or more factors, the PAF can be calculated according to the following formula: $P(E/D) \times (RR - 1) / RR$, where $P(E/D)$ was the proportion of cases exposed to the factor and RR was the risk ratio (Coughlin *et al.* 1994).

To examine for possible publication bias and heterogeneity, funnel plots were constructed of the number of subjects in case series studies by the percentage of those with the variable of interest.

RESULTS

The search strategy identified 154 papers (Robins *et al.* 1959; Dorpat & Ripley, 1960; Litman *et al.* 1963; Seager & Flood, 1965; Faberow & McEvoy, 1966; Rudestam, 1971, 1979; Shaffer *et al.* 1972; Barraclough *et al.* 1974; Neill *et al.* 1974; Barraclough & Pallis, 1975; Heiman, 1975; Sanborn & Sanborn, 1976; Diller, 1979; Murphy *et al.* 1979, 1992; Chynoweth *et al.* 1980; Weston, 1980; Heilig *et al.* 1982; Roy, 1982, 1983, 1992; Litman, 1984, 1989, 1996; Shafii *et al.* 1985, 1988; Allebeck *et al.* 1986; Fowler *et al.* 1986; Rich *et al.* 1986, 1988, 1990; Berglund *et al.* 1987; Biro, 1987; Brent *et al.* 1987, 1988, 1993a,b, 1994, 1999; Arato *et al.* 1988; Shaffer, 1988; Andersson-Segesten, 1989; Brent, 1989, 1995; Rao *et al.* 1989; Runeson, 1989; Spellman & Heyne, 1989; Åsgård, 1990; Beskow *et al.* 1990; Conwell *et al.* 1990, 1991, 1996, 1998; Dooley, 1990; Faberow *et al.* 1990; Kelleher & Daly, 1990; Murphy & Wetzel, 1990; Thorslund, 1990; Younger *et al.* 1990; Appleby, 1991; Garza-Leal & Landron, 1991; Martunen *et al.* 1991, 1993a,b, 1994a,b, 1995, 1997, 1998; Runeson & Beskow, 1991a,b; Wolford *et al.* 1991; Heikkinen *et al.* 1992, 1994, 1995, 1997; Horton-Deutsch *et al.* 1992; Little, 1992; Rich & Runeson, 1992; Runeson & Rich, 1992; Apter *et al.* 1993; Buteau *et al.* 1993; Clark, 1993; Duberstein *et al.* 1993, 1994, 1998; Henriksson *et al.*

1993, 1995a,b, 1996; Mendelson & Rich, 1993; Allgulander, 1994; Hendin, 1994; Isacson *et al.* 1994; Isometsä *et al.* 1994a,b,c,d, 1995a,b, 1996a,b,c, 1997; Lesage *et al.* 1994; Milne *et al.* 1994; Obafunwa & Busuttil, 1994; Rao, 1994; Schneidman, 1994; Akuskai, 1995; Canetto & Lester, 1995; Cheng, 1995; Cohler & Jenuzrine, 1995; Conwell & Brent, 1995; Duberstein, 1995; Geddes & Juszczak, 1995; Jacobs & Klein-Benheim, 1995; Kjelsberg *et al.* 1995; Seguin *et al.* 1995; Shaffer *et al.* 1995, 1996; Dennehy *et al.* 1996; Gould *et al.* 1996, 1998; Kelly & Mann, 1996; Sorri *et al.* 1996; Foster *et al.* 1997, 1999; He & Lester, 1997; Heilä *et al.* 1997, 1998, 1999a,b; Malmberg *et al.* 1997; Pirkola *et al.* 1997, 1999a,b,c; Portsteinsson *et al.* 1997; Isometsä & Lönnqvist, 1998; Lindeman *et al.* 1998, 1999; Ohberg & Lönnqvist, 1998; Rothberg, 1998; Appleby *et al.* 1999; Cavanagh *et al.* 1999a,b; De Leo *et al.* 1999; Drehner *et al.* 1999; Pearson *et al.* 1999; Renaud *et al.* 1999; Saarinen *et al.* 1999; Vijayakumar & Rajkumar, 1999). Seventy-five papers were judged eligible for inclusion. Fifty-three were case series reports (Robins *et al.* 1959; Dorpat & Ripley, 1960; Litman *et al.* 1963; Rudestam, 1971; Barraclough *et al.* 1974; Murphy *et al.* 1979; Chynoweth *et al.* 1980; Fowler *et al.* 1986; Rich *et al.* 1986, 1988, 1990; Biro, 1987; Arato *et al.* 1988; Rao *et al.* 1989; Runeson, 1989; Åsgård, 1990; Conwell *et al.* 1990, 1991, 1996, 1998; Martunen *et al.* 1991, 1993a, 1994a,b, 1995, 1997; Runeson *et al.* 1991a; Heikkinen *et al.* 1992, 1994, 1995; Horton-Deutsch *et al.* 1992; Apter *et al.* 1993; Duberstein *et al.* 1993; Henriksson *et al.* 1993, 1995a, 1996; Isacson *et al.* 1994; Isometsä *et al.* 1994a,b,c,d, 1995a,b, 1996a,b, 1997; Kelly & Mann, 1996; Sorri *et al.* 1996; Foster *et al.* 1997; Heilä *et al.* 1997; Pirkola *et al.* 1997; Portsteinsson *et al.* 1997; Lindeman *et al.* 1998) and 22 were case controlled studies (Barraclough & Pallis, 1975; Shafii *et al.* 1985, 1988; Brent *et al.* 1988, 1993a, 1994; Faberow *et al.* 1990; Wolford *et al.* 1991; Duberstein *et al.* 1994; Lesage *et al.* 1994; Cheng, 1995; Henriksson *et al.* 1995b; Gould *et al.* 1996; Isometsä *et al.* 1996c; Shaffer *et al.* 1996; Heikkinen *et al.* 1999; Appleby *et al.* 1999; Cavanagh *et al.* 1999a,b; Foster *et al.* 1999; Renaud *et al.* 1999; Vijayakumar & Rajkumar, 1999). The majority of case series reports (Litman *et al.* 1963; Fowler *et al.* 1986; Rao *et al.* 1989; Runeson, 1989;

Table 1. Details of case-control studies

Studies	Cases N	Controls N	Suicide cases	Control subjects
Foster <i>et al.</i> 1999	117	117	Adults	Living community controls
Cavanagh <i>et al.</i> 1999 <i>a, b</i>	45	40	Adults	Living controls matched for mental disorder
Vijayakumar & Rajkumar, 1999	100	100	Adults	Living neighbourhood controls
Appleby <i>et al.</i> 1999	84	64	Cases under 35	Living community controls under 35
Duberstein <i>et al.</i> 1994	52	52	Male & female divided < 50 years and > 50 years	Living university students and participants in on-going study
Lesage <i>et al.</i> 1994	75	75	Young males	Random living controls
Cheng, 1995	113	226	Two aboriginal Taiwanese and one Han Chinese	Two random groups of living controls
Brent <i>et al.</i> 1988	27	56	Adolescents	Living suicidal in-patients
Brent <i>et al.</i> 1994	63	23	Adolescents	Living community controls
Brent <i>et al.</i> 1993 <i>a</i>	67	67	Adolescents	Living community controls
Gould <i>et al.</i> 1996	120	147	Adolescents	Living community controls
Shaffer <i>et al.</i> 1996	120	147	Adolescents	Living community controls
Shafii <i>et al.</i> 1988	21	21	Adolescents	Living friends of the deceased
Shafii <i>et al.</i> 1985	20	17	Adolescents	Living friends of the deceased
Renaud <i>et al.</i> 1999	59	18	Adolescent with disruptive disorder	Living controls with disruptive disorder
Wolford <i>et al.</i> 1991	48	224	Psychiatric in-patients	Acute and long-term living inpatients
Barracough <i>et al.</i> 1975	64	128	Depressed suicides	Living controls with depression
Isometsä <i>et al.</i> 1996 <i>c</i>	66	67	Personality disorder	Non-personality disordered suicide victim
Heikkinen <i>et al.</i> 1997	56	56	Personality disorder	Non-personality disordered suicide victim
Henriksson <i>et al.</i> 1995 <i>b</i>	60	60	Cancer suicides	Suicides with no cancer history
Faberow <i>et al.</i> 1990	22	21	Vietnam veterans	Vietnam veterans killed in RTAs

RTA, Road traffic accident.

Åsgård, 1990; Conwell *et al.* 1990; Rich *et al.* 1990; Martunen *et al.* 1991, 1993*a, b*, 1995, 1997; Runeson & Beskow, 1991*a, b*; Horton-Deutsch *et al.* 1992; Apter *et al.* 1993; Duberstein *et al.* 1993; Heikkinen *et al.* 1994; Isometsä *et al.* 1994*a, b, c, d*, 1995*a, b*, 1996*a, b, c*, 1997; Henriksson *et al.* 1996; Sorri *et al.* 1996; Foster *et al.* 1997; Heila *et al.* 1997; Pirkola *et al.* 1997; Portsteinsson *et al.* 1997; Lindeman *et al.* 1998) examined subgroups selected by age, gender and diagnostic category. With the exception of one study (Vijayakumar & Rajkumar, 1999), all case-control studies (Barracough *et al.* 1975; Brent *et al.* 1988, 1993, 1994; Shafii *et al.* 1985, 1988; Faberow *et al.* 1990; Wolford *et al.* 1991; Duberstein *et al.* 1994; Lesage *et al.* 1994; Cheng, 1995; Henriksson *et al.* 1995*b*; Gould *et al.* 1996; Isometsä *et al.* 1996*c*; Shaffer *et al.* 1996; Heikkinen *et al.* 1997; Appleby *et al.* 1999; Cavanagh *et al.* 1999*a, b*; Foster *et al.* 1999; Renaud *et al.* 1999) examined specific subgroups, which are described in Table 1. Three of these studies included controls who had killed themselves and were excluded from the analyses (Henriksson *et al.* 1995*b*; Isometsä & Henriksson, 1996*c*; Heikkinen *et al.* 1997).

We excluded 79 reports identified by the search strategy. Eighteen reports were excluded because

they were narrative or observational descriptions of psychological autopsy methodology (Schaffer *et al.* 1972; Brent, 1989, 1995; Litman, 1989, 1996; Spellman & Heyne, 1989; Murphy & Wetzel, 1990; Runeson & Beskow, 1991*b*; Roy, 1992; Martunen *et al.* 1993*b*, 1998; Rao, 1994; Canetto & Lester, 1995; Cohler & Jenuzrine, 1995; Conwell & Brent, 1995; He & Lester, 1997; Jacobs & Klein-Benheim, 1995; Heilä *et al.* 1999*a*). Twenty-four reports were excluded because the study did not include direct interviews with informants and relied entirely on records-based information (Seager & Flood, 1965; Faberow & McEvoy, 1966; Heiman, 1975; Roy, 1982, 1983; Allebeck *et al.* 1986; Berglund *et al.* 1987; Brent *et al.* 1987; Dooley, 1990; Kelleher & Daly, 1990; Thorslund, 1990; Younger *et al.* 1990; Appleby, 1991; Rich & Runeson, 1992; Buteau *et al.* 1993; Allgulander, 1994; Milne *et al.* 1994; Obafunwa & Busuttil, 1994; Geddes & Juszczak, 1995; Kjelsberg *et al.* 1995; Dennehy *et al.* 1996; Duberstein *et al.* 1998; De Leo *et al.* 1999; Drehner *et al.* 1999).

Thirty-seven reports were excluded as the study was either a single case report, advanced new models of suicide or presented no new data (Neill *et al.* 1974; Sanborn & Sanborn, 1976; Diller, 1979; Rudestam, 1979; Weston, 1980;

Table 2. *Variables, medians and ranges of case series and case-controlled studies (expressed as percentages)*

Variables	Case series N	Case-controlled N		Case series		Case-controlled	
				Median (Range)	95% CI	Median (Range)	95% CI
Mental disorder	14	9		91 (23–100%)	81–98%	Cases 90 (86–97%) Controls 27 (0–91%)	88–95% 14–48%
Affective disorder	9	12		59 (30–93%)	45–70%	Cases 60 (23–95%) Controls 10 (2–82%)	35–87% 5–57%
Co-morbidity (CM)	9	9	CM with other mental disorders	44 (31–48%)	31–48%	Cases 36 (21–81%) Controls 13 (0–41%)	21–81% 0–41%
			CM with substance abuse	47 (21–57%)	21–57%	Cases 38 (19–57%) Controls 6 (0–13%)	19–57% 0–13%
Adversity	11	8	In last year	51 (8–93%)	27–82%	Cases 63 (29–93%)	29–93%
			Last 6 months–1 yr	45 (8–82%)	8–82%	Controls 39 (5–88%)	5–88%
			Last 3 months	46 (26–82%)	26–82%		
Service contact	10	9		29 (0–72%)	22–37%	Cases 46 (10–62%) Controls 21 (0–95%)	25–60% 2–67%
Communication of intent	9	5		66 (22–92%)	34–83%	Cases 56 (24–85%) Controls 18 (0–45%)	24–85% 0–45%
Deliberate self-harm	8	14		39 (30–63%)	30–49%	Cases 40 (16–68%) Controls 7 (0–39%)	24–53% 2–35%
Social isolation	8	5		50 (22–84%)	22–84%	Cases 42 (22–68%) Controls 21 (7–41%)	22–68% 7–41%
Physical ill	8	3		36 (4–72%)	4–72%	Cases 36 (29–48%) Controls 18 (10–43%)	29–48% 10–43%

Heilig *et al.* 1982; Litman, 1984; Andersson-Segesten, 1989; Beskow *et al.* 1990; Garza-Leal & Landron, 1991; Little, 1992; Murphy *et al.* 1992; Runeson & Rich, 1992; Brent *et al.* 1993*b*, 1999; Clark, 1993; Mendelson & Rich, 1993; Hendin, 1994; Shneidman, 1994; Akuskai, 1995; Conwell *et al.* 1995; Duberstein, 1995; Seguin *et al.* 1995; Shaffer *et al.* 1995; He & Lester, 1997; Malmberg *et al.* 1997; Gould *et al.* 1998; Heilä *et al.* 1998, 1999*a,b*; Isometsä & Lönnqvist, 1998; Marttunen *et al.* 1998; Lindeman *et al.* 1999; Pearson *et al.* 1999; Pirkola *et al.* 1999*b,c*; Saarinen *et al.* 1999).

Table 2 describes the median proportion, 95% confidence intervals and ranges of all the variables studied by both case series and case-control techniques. In the case series, the clearest association between suicide and any of the study variables was with mental disorder – 91% (95% CI 81 to 98%) of suicides had a mental disorder. Although the range is wide (23 to 100%), this was solely attributable to a single study of suicide by self-burning among Indian women (Rao *et al.* 1989). The second lowest rate for mental disorder was 74%. The majority of the cases of mental disorder was of depression. However, the rates of co-morbidity with other mental disorders and

substance abuse are of note. Although the median proportions of social adversity and isolation and previous communication of intent are similar, the ranges and confidence limits of these are far wider.

In controlled studies, clear differences were evident in the median proportions of cases (90%) and controls (27%) with mental disorder and the 95% CIs do not overlap (88 to 95% *v.* 14 to 48%). The medians for affective disorder and co-morbidity were notably different in cases and controls, but the only non-overlap of 95% CIs was for co-morbid mental disorder with substance abuse (19 to 57% and 0 to 13% respectively). However, the large confidence intervals show a lack of precision in the estimates and interpretation should be accordingly cautious. The differences in median proportions were slightly less marked for the social variables, and the confidence intervals generally wider, reflecting both the greater range of study results and the smaller number of pertinent studies.

Table 3 shows the results of the population attributable fraction calculation from the seven case-control studies (Shaffi *et al.* 1988; Brent *et al.* 1993*a*; Lesage *et al.* 1994; Shaffer *et al.* 1996; Appleby *et al.* 1999; Foster *et al.* 1999;

Table 3. Population attributable fraction (PAF) for mental disorder, affective disorder and co-morbidity in case-control studies

Study	Any mental disorder			Affective disorder			Co-morbidity with other Axis I			Co-morbidity specifically with substance abuse		
	P(E/D) %	RR	PAF %	P(E/D) %	RR	PAF %	P(E/D) %	RR	PAF %	P(E/D) %	RR	PAF %
Brent <i>et al.</i> 1993a	89.6	2.61	55	49.3	4.74	39	48.5	6.46	41	27.3	6.1	23
Lesage <i>et al.</i> 1994	88	2.34	50	60	4.22	46						
Shaffer <i>et al.</i> 1996	90	3.75	66	61	15.2	57						
Shafii <i>et al.</i> 1988	95	1.98	47	76	3.2	52	81	2.79	52	38	7.6	33
Appleby <i>et al.</i> 1999	90	3.33	63	23	11.5	21				57	5.2	46
Foster <i>et al.</i> 1999	86	3.73	63	36	6.0	30				44	3.38	31
Vijayakumar & Rajkumar, 1999	88	6.28	74	35	7.0	30				34	4.25	26

P(E/D), proportion of cases exposed to factor; RR, risk ratio; PAF, population attributable fraction.

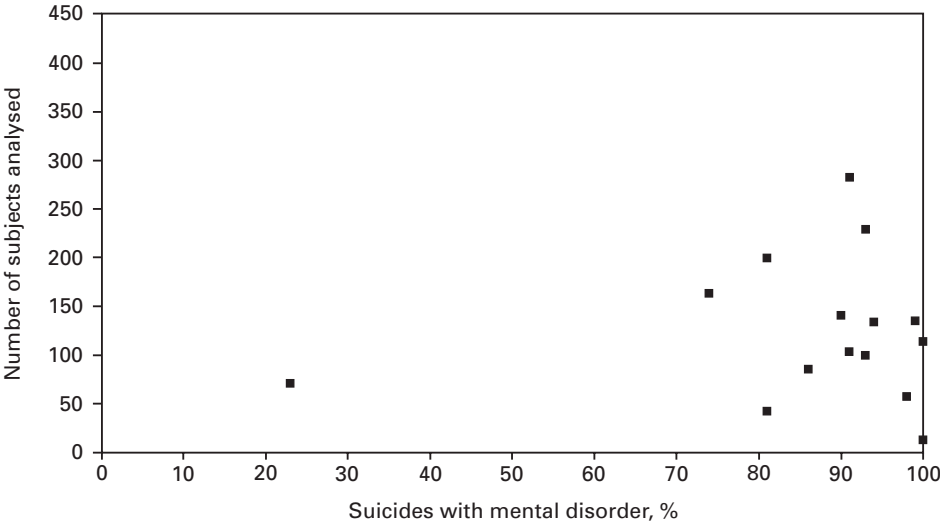


Fig. 1. Individual case series studies: showing the percentage of subjects with a mental disorder by the number of subjects autopsied.

Vijayakumar & Rajkumar, 1999) that reported data on both cases and controls and were not focused solely on one subgroup of diagnoses. All seven studies examined young adult or adolescent populations and all seven used living community control groups. They found that between 47 and 74% of the suicides examined were attributable to mental disorder. Affective disorders (21–57%) made the most substantial contributions. However, co-morbid mental disorders (41–52%) and co-morbidity between mental disorder and substance abuse (23–46%) also appear to be of importance. Examination of the funnel plots revealed no evidence of publication bias in studies that examined the association between mental disorders and suicide

(Fig. 1). This applied to both mental disorder as a general category and individual diagnostic categories. There was, however, evidence of a ceiling effect for mental disorder. Funnel plots of studies reporting on social variables did not conform to any pattern whatsoever, often simply due to a lack of data. We found no clear evidence of publication bias, or any clear reasons for apparent heterogeneity.

DISCUSSION

This systematic review found that, of the variables most often studied and regarded as clinically useful, mental disorders had the strongest associations with suicide. This held for subjects

suffering from one diagnosis and those with both a mental disorder and an addiction problem. These findings are fairly homogeneous across studies. We found less evidence of association between suicide and the other variables examined. This appears to be attributable to both wider ranging results and a smaller number of studies. Overall, the results of case-controlled studies should be viewed on an individual basis in light of what cases and controls consist. The Population Attributable Fractions suggest that between a half and three-quarters of suicides could be avoided were it possible to have completely effective treatment, or prevention, of mental disorders.

Is our finding of a strong and consistent association between mental disorder and suicide reliable? First, the psychological autopsy technique is regarded as valid in determining accurate diagnosis and in systematically measuring other variables post-mortem (Kelly & Mann, 1996). Secondly, our results are consistent with the strong positive evidence for the role of mental disorder throughout the suicide literature. Thirdly, we believe our study covers all the relevant papers in the area and we detected no suggestion of publication bias. However, there are several potential problems with our study. Of most importance is attribution bias. Coroners, and their equivalents in other countries, may be more likely to return suicide verdicts in those with known mental disorders; although the legal process is informed by a variety of sources and verdicts are not determined by the opinion of one legal officer. A further source of bias is the potential for the 'search after meaning'. Informants may, in retrospect, identify a number of causal factors that could explain the suicide, and while some may focus on external factors such as adverse life events, others may well identify internal factors such as mental disorder. The use of corroborating evidence from informants other than close relatives, as well as medical and other records, in psychological autopsy studies should however offset such biases. Finally, the studies from which the PAFs were calculated were on younger age groups and the available data suggests that the importance of mental illness in suicide increases with age. Our results may therefore represent an underestimate of the true PAF.

Why was the range of results for the other variables wider? The studies were from different

geographical locations, but there was no evidence pointing towards systematic variations between countries. Furthermore, the vast majority of studies were conducted in Western Europe and the USA, societies that are relatively similar in cultural background. Neither was there evidence of systematic international difference in the ascertainment of suicide. An alternative explanation is that mental disorder, as currently defined, is a relatively homogeneous concept in most cultural groups but psychosocial factors are less so. Thus, while the interaction between a subject and a mental disorder may be more predictable and lead to a specific outcome – hopelessness and suicidal ideas are defining characteristics of depression – the interaction between a subject and social adversity may be less predictable. This is, however, speculative and we found no clear evidence for heterogeneity between different studies. It appears that there are simply insufficient data on specific diagnoses and psychosocial factors available from previous psychological autopsy studies; although the same evidence is sufficient to demonstrate the importance of mental disorders generally.

What are the clinical implications of these findings? Strategies aimed at reducing suicide currently fall into two main groups (Rose, 1992). First, population-based methods focus on reducing the availability of means, for example by fitting catalytic converters in cars to reduce the lethality of exhaust fumes. These strategies are supported by recent reports of an overall drop in suicide rates (McClure, 2000). However, suicide rates among young males remain higher than 20 years ago and one method of suicide is often replaced by another. The second approach is to focus on those at increased risk. However, the lack of sensitivity and specificity of risk factors in the context of a relatively rare event like suicide have led some to question the usefulness of risk factors such as mental disorder (Powell *et al.* 2000). Furthermore, as a result of substantial overlap in risk factors, it can be difficult to interpret some of the risk data and decide which group or risk factor to target. Thus, reports of high relative and attributable risks associated with unemployment may be overestimates due to lack of controlling for the association with mental disorder (Mortensen *et al.* 2000).

On the basis of this review we would suggest that it is at least legitimate and may be most

effective to aim to optimize the management of those with mental disorder in general. Some might argue that it would be better to concentrate specifically on hopelessness and impulsivity, but specific treatments for these are currently experimental and not readily accessible, particularly in primary care. By contrast, effective pharmacological and psychological interventions are much more readily available for most mental disorders. We suggest that improving the detection and treatment of all disorders, particularly in primary care, may be the most effective way of reducing suicide rates. It may be necessary to use particular strategies in specific settings (Katon *et al.* 1996) rather than revert simply to the idea of more education (Thompson *et al.* 2000).

What are the research implications? We are not saying that particular disorders or psychosocial factors are unimportant. Rather, the available studies do not offer clear evidence that they are the most important variables. Further studies should focus on the interactions between particular mental disorders, social adversity, social isolation and previous communications of intent. In the meantime, it is our opinion that the core responsibility of doctors in trying to reduce suicide rates remains the identification and treatment of mental disorders.

We are grateful to Ms Catherine Allen of the University of Edinburgh, Scotland for her assistance with this study.

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